#11

Attorney Docket: 060258-0273950
Client Reference: 2980126US/A/HEI

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re PATENT APPLICATION of: Confirmation Number: 4022
RÄSÄNEN
Application No.: 09/647784 Group Art Unit: 2666

Filed: October 5, 2000 Examiner: Scheibel, R.

Title: IMPLEMENTATION OF MULTIPLE SIMULTANEOUS CALLS IN A MOBILE COMMUNICATION SYSTEM

DECLARATION UNDER RULE 131

Commissioner for Patents
P.O.Box 1450
Alexandria, VA 22313-1450

Sir:

I, Juha Räsänen, hereby attest as follows:

I conceived of:

- the claimed method of producing two or more simultaneous data calls for one mobile station in a mobile communication system, the method comprising the steps of assigning only one common traffic channel to two or more simultaneous calls of the mobile station, and sharing the capacity of the common traffic channel between the simultaneous calls, negotiating between the mobile station and the network about the channel capacity needed for each call or connection, establishing a radio link protocol link or a link access control protocol link for each call or each connection over the common traffic channel between the mobile station and the interworking function, and transmitting the data packets of a packet-switched call either interleaved with the protocol frames of the radio link protocol link or the link access control protocol link or encapsulated in the protocol frames, and
- the claimed mobile communication network comprising means for establishing one traffic channel of the mobile communication network for two or more simultaneous calls of a mobile station, means for sharing the capacity of said common traffic channel between said simultaneous calls, means for negotiating between the mobile station and the network about the channel capacity needed for each call or connection, and means for adjusting the capacity of said common traffic channel dynamically;

(which is the claimed invention) in Finland prior to February 12, 1998. During the period between February 12, 1998 and February 17, 1998, I documented my conception of the claimed invention by completing the attached invention report and signed that invention report on February 17, 1998. The drawings included in that report include my initials and the date 17.2.98 indicating their completion of February 17, 1998. This invention report was submitted by me to my employer, Nokia Networks Oy in Finland.

Over the next month and a half, I communicated and worked in cooperation with Mr. Tapio Äkräs of the patent firm Kolster Oy AB (in Finland) and participated in the patent application drafting process by reviewing the patent application draft. As a result of this diligence on my part, the Finnish patent application (Application 980828; the earliest priority application for the present application) was filed on April 9, 1998.

All statements made of my knowledge are true, and all statements made on information and belief are believed to be true. I acknowledge that willful false statements and the like are punishable by fine, imprisonment, or both, under 18 U.S.C. §1001 and may jeopardize the validity of the application or any patent issuing thereon.

By: _____
Yuha Räsänen

Date: Feb 23, 2004

NOKIA

CONFIDENTIAL

☐ File copy A
☐ Inventors copy B

Opinion report COPY accepted ____/____ 19____ ____
Communication to inventor COPY accepted ____/____ 19____ ____

INVENTION REPORT

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Title of invention:
Support of multimedia calls in a mobile network.

Inventor(s), profession:
Juha Räsänen
Section manager

Home address:
Pensaskertantie 8 A
02660 ~~Espoo~~

Short description of invention:
Multiple simultaneous calls and multiple simultaneous connection per call are basic requirements in the UMTS specifications (drafts). (by a MS)
This report describes a method that optimizes the usage (efficiency) of the available channel capacity on the "multiple calls/connections per MS" case. Also applicable to the further development of the GSM system.
A possibility to become essential.

In my/our opinion the invention belongs to category:*)
(Not necessary to fill in) A

Enclosures: 10 pages

The invention becomes public: 11 / 5 1998

I ~~/we~~ consider the invention to belong to the category indicated above and to my ~~/our~~ best knowledge, I am ~~/we are~~ the sole/and original inventor(s) of this invention.

The company may, by virtue of the valid legislation, be entitled to full or partial rights to the invention. I ~~/we~~ acknowledge my ~~/our~~ obligation to sign as inventor(s) all documents that may be required for protecting the invention in different countries.

Signature of inventor(s):
Date 17. 2 1998
Signature Juha Räsänen

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I ACKNOWLEDGE RECEIPT OF THE COMPANY'S DECISION REGARDING THE INVENTION INDICATED ABOVE

Signature of inventor(s):

Date / 19

2

INVENTION REPORT RECEIVED

Code:	Company:	Department:
14175	MSC	

Place: Espoo Date: 18.2.98

Signature: Ulrich Wilhelm

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OPINIONS

(Yes = 1, maybe = 2, no = 3)

Technical level
☐ new
☐ practicable
☐ patentable

Development level
☐ ready for protecting
☐ development work continues
☐ idea worthy of development

Marketing level
☐ highly valuable
☐ star product
☐ worthy of patenting

Level of protection
☐ important to protect
☐ easy to defend
☐ difficult to evade

In my opinion the invention belongs to category____*)

I propose that the reported invention be
☐ reserved by the company
☐ left for the use of the inventor(s)

Place: Date:

Signature:

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REPLY TO THE INVENTOR(S)

I make it known hereby that the company has decided to:
☐ reserve the invention for the company
☐ reserve the right to use the invention
☐ allow the inventor(s) the liberty for independent action
☐ issue the enclosed statement

☐ keep the invention secret
☐ apply for a patent on the invention
☐ refrain from applying for a patent on the invention
☐ postpone the decision about applying for a patent

The invention belongs to category_____*)

If dissatisfied with this decision, the inventor(s) may appeal within 30 days to the Board of the company.

Announcement reward:

Place: Date:

NTC/NWS/MSG/MSCHLR
Juha Räsänen

12.02.1998

Invention report: Support of multimedia calls in a mobile network

1. BACKGROUND

One of the requirements of the third generation mobile network UMTS is that the network and the mobile stations shall support multimedia calls including more than one simultaneous call (which may be single connection calls or multimedia/multiconnection calls) between the mobile station and multiple counterparts in separate destinations. It is further required that the different connection and calls can be added and dropped independently of each other.

Further requirements: The utilization of the channel capacity shall be as high as possible, the handovers shall be as easy as possible to manage both for the network and the MS, etc.

(References:
ETSI UMTS Technical Report TR 22.60 v.1.0.0 "Mobile multimedia services including mobile Intranet and Internet services", December 1997,
ETSI UMTS Technical Specification TS 22.05 v.1.4.1 "Services and Service Capabilities", December 1997).

SMG/ETSI has started to specify higher data rates (> 64 kbit/s) for the GSM networks in December 1997 within the EDGE (Enhanced Data Rates for GSM Evolution) to make the GSM PLMN better support the forthcoming multimedia services. The above mentioned UMTS requirements are applicable to the evolution of the GSM PLMN too.

This report describes a set of measures (a solution, a method) to meet the above mentioned requirements, especially this solution supports a high efficiency as to the utilization of the available channel capacity and makes the handover procedure of the simultaneous calls easy.

2. PROPOSED SOLUTION

2.1. Overview

- Only one TCH is set up between MS and IWF. (TCH is set up when the first call is set up.)
- The TCH is shared between the data calls of the MS.
- The TCH is shared between the possibly more than one connections of a (multimedia) call.
- TCH capacity is increased (or reshared) when a new call or a new connection is set up.
- TCH capacity is decreased (or reshared) when a call or a connection is released. (TCH is released when the last call is released.)
- NT calls use virtual links inside the common RLP/LAC.
- Separate NT connections of a call use virtual links inside the common RLP/LAC.
- T calls use virtual links inside the common RLP/LAC, without frame retransmissions to guarantee a constant rate and delay.
- Separate T connections of a call use virtual links inside the common RLP/LAC, without frame retransmissions to guarantee a constant rate and delay.
- Packet switched traffic is transmitted in the same TCH with the circuit switched traffic sharing the capacity of the channel available for the NT traffic (RLP/LAC frames).
- T connections are monitored and
the sending of protocol fill is prevented to save capacity for the RLP/LAC frame transmission.

Figure 1 describes the configuration with purely circuit switched application in a GSM environment. Figure 2 describes the configuration with both circuit and packet switched applications. The environment in this example is a 3rd generation mobile network.

2.2. Detailed description

TRAFFIC CHANNEL (TCH) SETUP:

• A traffic channel (which may consist of separate subchannels or substreams as in the Multislot configuration or HSCSD in GSM) is allocated when the first call is set up. If several calls are set up simultaneously, still only one traffic channel is allocated, but the capacity is defined by the aggregate requirements of the separate calls, both circuit switched and packet switched if there are both to be run in the channel.

DYNAMIC TCH CAPACITY CONTROL:
• If the MS has ongoing call(s) and a new call, or a new connection within an ongoing call, is set up, transmission capacity in the channel is increased by the network. This can mean for example:
- Allocation of more subchannels/substreams in a multislot configuration and/or
- change of channel coding to increase the data rate and/or
- change the code length (WCDMA), or other available means offered by the used system.
• If the network cannot temporarily allocate more or the requested amount of transmission capacity when a new call or a new connection is set up, the available capacity is (re)shared by the calls. The possible transparent calls need a constant capacity but the non-transparent calls and the packet connections can be maintained with a minimal capacity by using flow control and buffering and congestion control at the ends of the traffic channel. The network allocates the requested capacity later when capacity becomes free in the network.

TRAFFIC CHANNEL RELEASE:
• When a call is released but the MS has still at least one ongoing call, extra transmission capacity is released (by releasing subchannels, changing channel coding, changing code length, or by other available means).

ALLOCATION OF CAPACITY TO CALLS AND CONNECTIONS:
• Both T and NT calls and/or connections may be required simultaneously in the TCH. There are several ways to deal with the T/NT separation and the separation of different T connections:
° Agreed parts (bits) of the transmission frame structure are allocated to the T connections.
° Transparent (T) data is packed in RLP/LAC frames (without the resending facility, i.e. in the unacknowkedged mode) for transmission, i.e. virtual channels are allocated in the gross traffic channel to T connections (too). The sending RLP/LAC entity guarantees each T connection a frame sending at regular intervals to maintain a constant (or nearly constant) delay and a constant rate.
In this way the reallocation of the channel capacity is easier upon the setup and release of connections.
When the MS sets up a(nother) T call or connection in addition to the ongoing ones, the network (call control) recognizes that the MS already has an ongoing data call and routes the call/connection to the same IWF pool element. The IWF already has a RLP/LAC - a new virtual channel is set up between the RLP/LAC entities. IWF matches the virtual circuits to the external connections.
Figure 3 describes the operating principle.
• To separate NT connections from each other (and possibly from T and packet connections), the RLP/LAC frames are provided with a field enabling the use of virtual channels between the RLP/LAC entities.
When the MS sets up another NT call or connection in addition to the ongoing ones, the network (call control) recognizes that the MS already has an ongoing data call and routes the call/connection to the same IWF pool element. The IWF already has a RLP/LAC - a new virtual channel is set up between the RLP/LAC entities. IWF matches the virtual circuits to the external connections.
Figure 3 describes the operating principle.
• There are several ways to deal with the packet data:
° The packets or packet frames are run in the traffic channel interleaved with the LAC frames, figure 4. The receicer must be able to separate the LAC frames from the packets or packet frames.
° The packets are packed in LAC frames - with or without the resending facility - for transmission, i.e. a virtual channel is allocated in the gross traffic channel to the packet connections too.
The packet data traffic to/from the MS uses the virtual LAC connection set up between the MS and the IWU-A. IWU-A separates the packet data and the circuit switched data from each other to be forwarded to the packet data node PDN and the circuit switched IW handling, respectively, and further to the external connections.
In this way the reallocation of the channel capacity is easier upon the setup and release of connections.

Figure 5 describes the configuration in an environment where a 3rd generation add-on unit is added to a GSM MSC to support the 3rd generation radio access system.

OPTIMIZATION OF TCH EFFICIENCY:
• The use of the channel capacity is further increased as follows:
- MS and IWF monitor the traffic in the transparent connections.
- If a transparent call sends protocol fill, e.g. flags or supervision frames, these are not sent in the traffic channel. Instead, RLP/LAC frames of NT or packet connections are sent.
- The receiving party returns the protcol fill in the transparent stream.
- Ref. to figure 3.

IWF ARRANGEMENTS:
• An integrated multicapability IWF pool resource is allocated by the network upon the first call set up by a multicall capable MS. Such a pool separates the virtual channels of separate simultaneous calls to separate physical outgoing channels each of which may use for example a modem, a FAX adaptor or an ISDN rate adaptor in the pool.
Because there may be simple modem only pools, UDI only pools etc. in the IWF, the call setup shall indicate the multicall capability of the MS.
Figure 6 describes a multicapability IWF pool.

3RD GENERATION CONFIGURATIONS
• Figure 5 describes the application of the proposal in a 3rd generation mobile network build on a GSM MSC. The NT path consists of concatenated LAC and RLP legs.
The MS may have simultaneously both circuit switched and packet switched calls. The circuit switched and packet switched streams are separated/combined in IWU-A.
The packet data is transmitted between IWU-A and PDN.
The circuit switched data is transmitted between IWU-A and IWF in an RLP using virtual connection per call and/or connection.
• The solution is applicable also to more integrated, pure 3rd generation environments, figure 7.

3. CONCLUSIONS

The proposed solution offers some clear advantages:
• Compared to a solution where separate simultaneous calls of a MS use separate TCHs, this solution optimizes the usage (efficiency) of the TCH:
- If there is temporarily no data transmission in one call, other call(s) can fully use the free channel capacity.
- The advantage is huge if one call transports data in the downlink direction and another call simultaneously in the uplink direction.
• The use of the available channel capacity is optimized from the network's point of view. More calls can be supported/maintained with the available TCH capacity in a congestion situation (busy hour).
• Handovers are simple both from the MS's and from the network's point of view. Only a single channel needs to be handed over.

Application areas of the proposed solution:
• GSM/DCS/PCS networks
• Derivatives of GSM/DCS/PCS, like Wireless local loop.
• Third generation mobile networks.
• Satellite mobile networks.

The proposal has a possibility to become essential through the ongoing 3rd generation mobile network specifications (UMTS, JAFFA, FPLMTS) and the parallel ongoing further development by ETSI and ANSI of the GSM/DCS/PCS specifications.

Becomes public *11th of May 1998.*

JRa 17.2.98

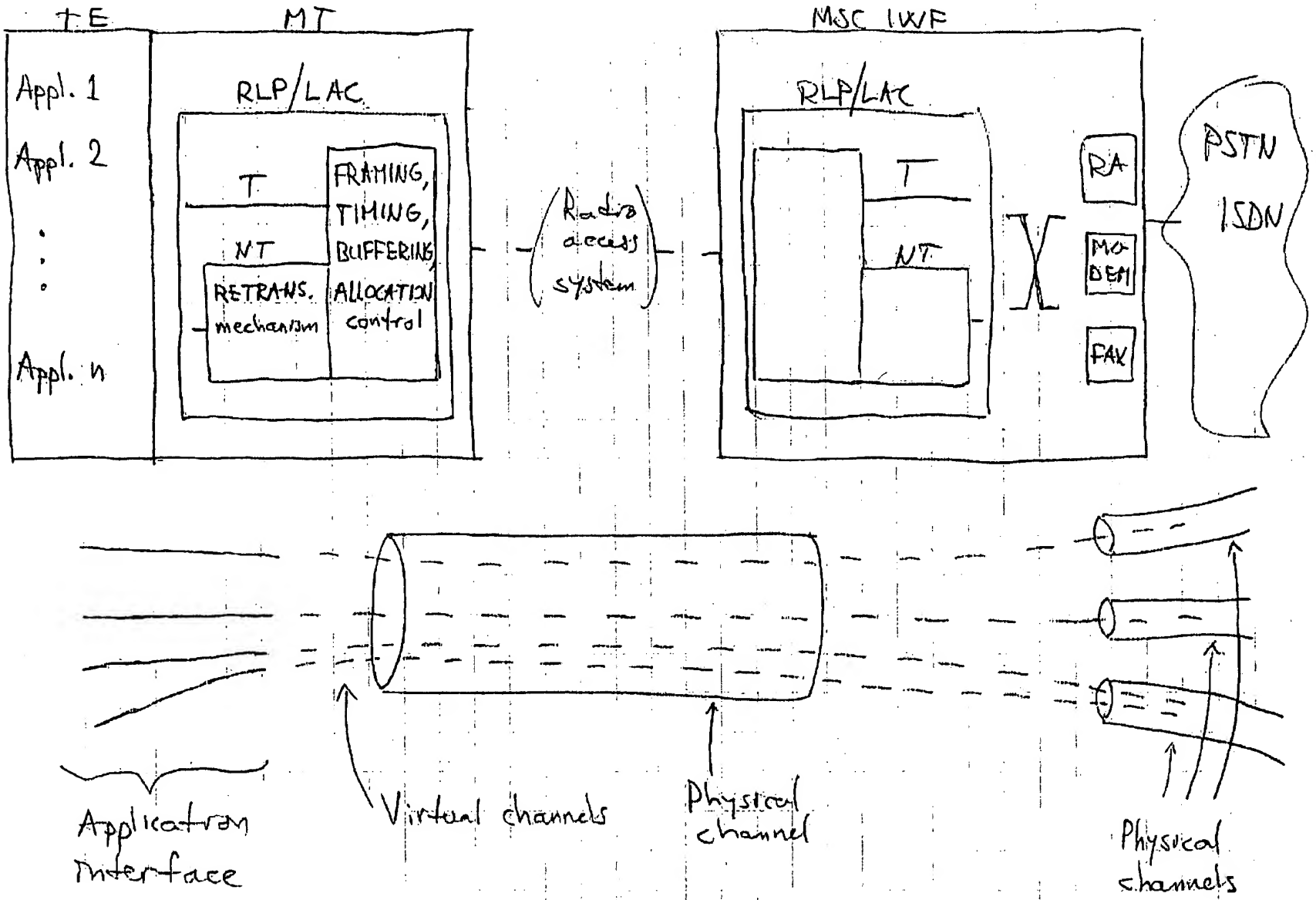


Figure 3a. Virtual channels in a RLP/LAC link.

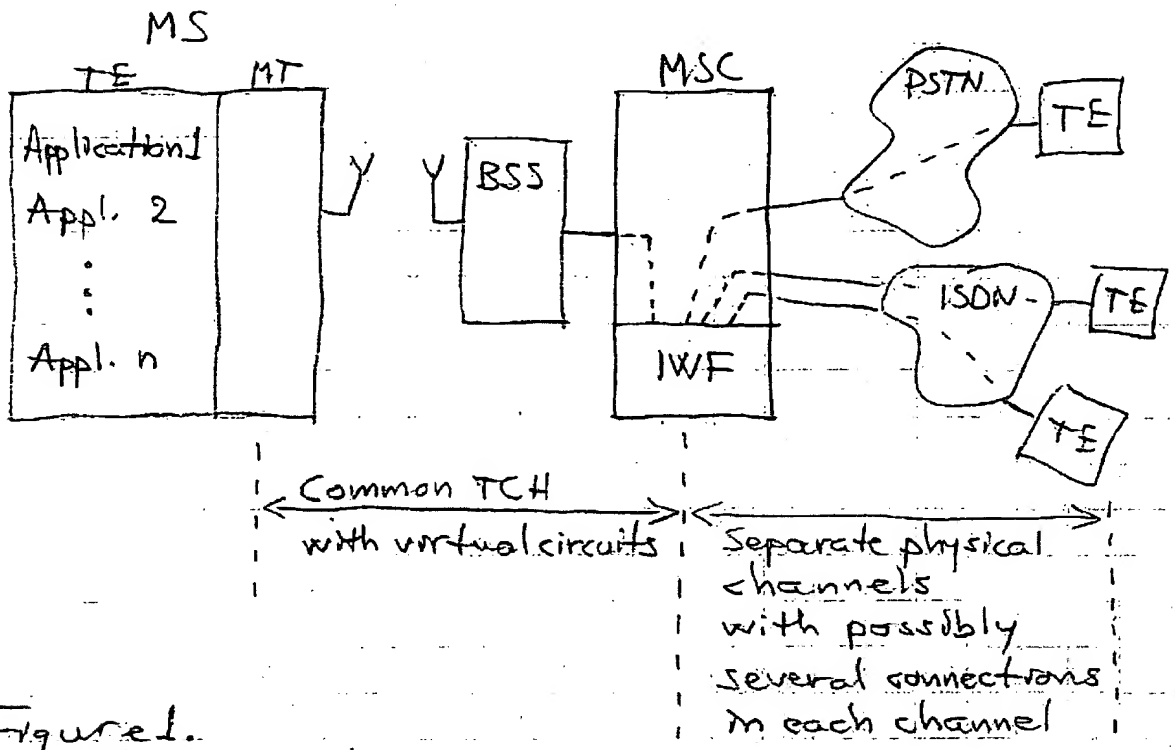
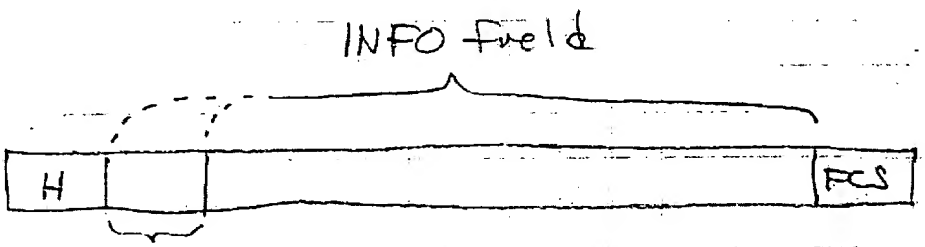


Figure 1.
Multiple simultaneous
circuit switched calls by one MS in a GSM environment.

H = header
FCS = Frame Check Sequence



Virtual channel identifier:
- call identifier
- connection identifier

Figure 3b. Virtual channel identification
in - bi D/I Air Frame

JR à 17.2.98

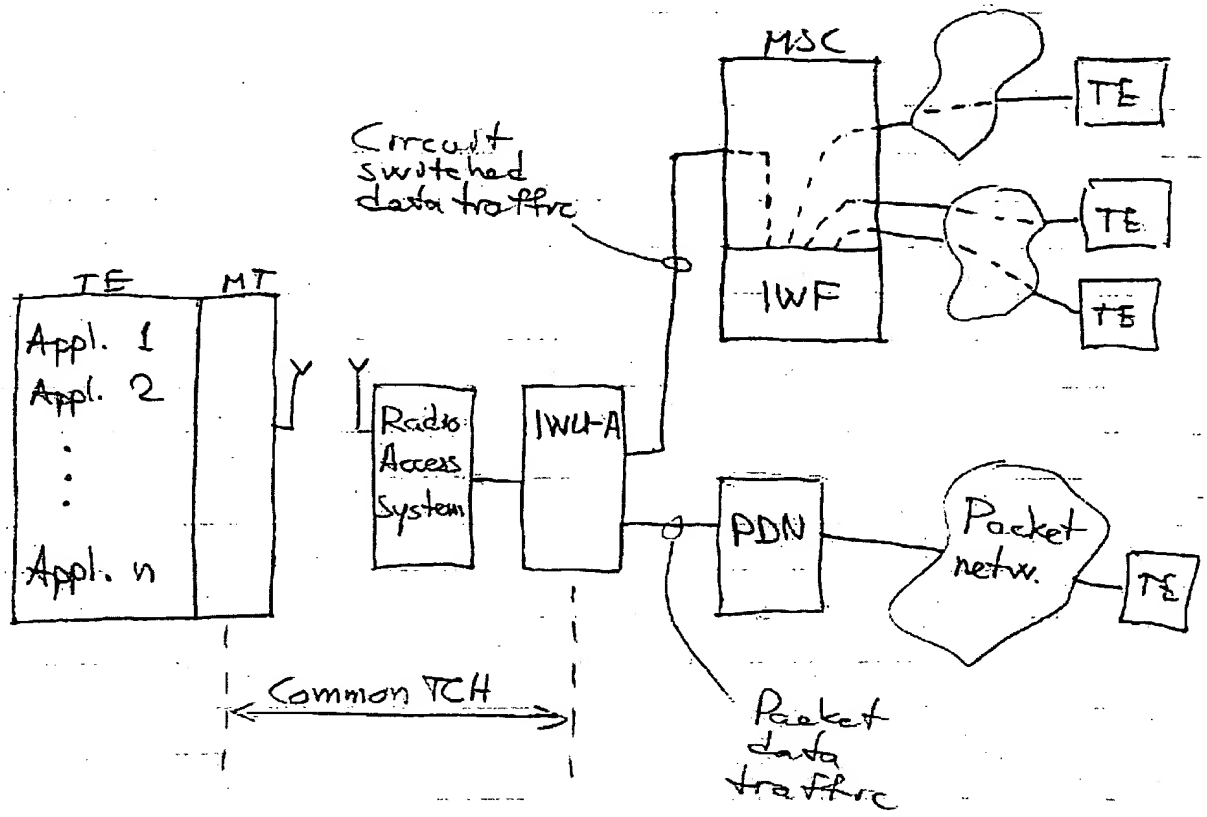


Figure 2.
Simultaneous circuit and packet switched calls by one MS in an environment with a 3rd generation radio access.

JRA 17.2.98

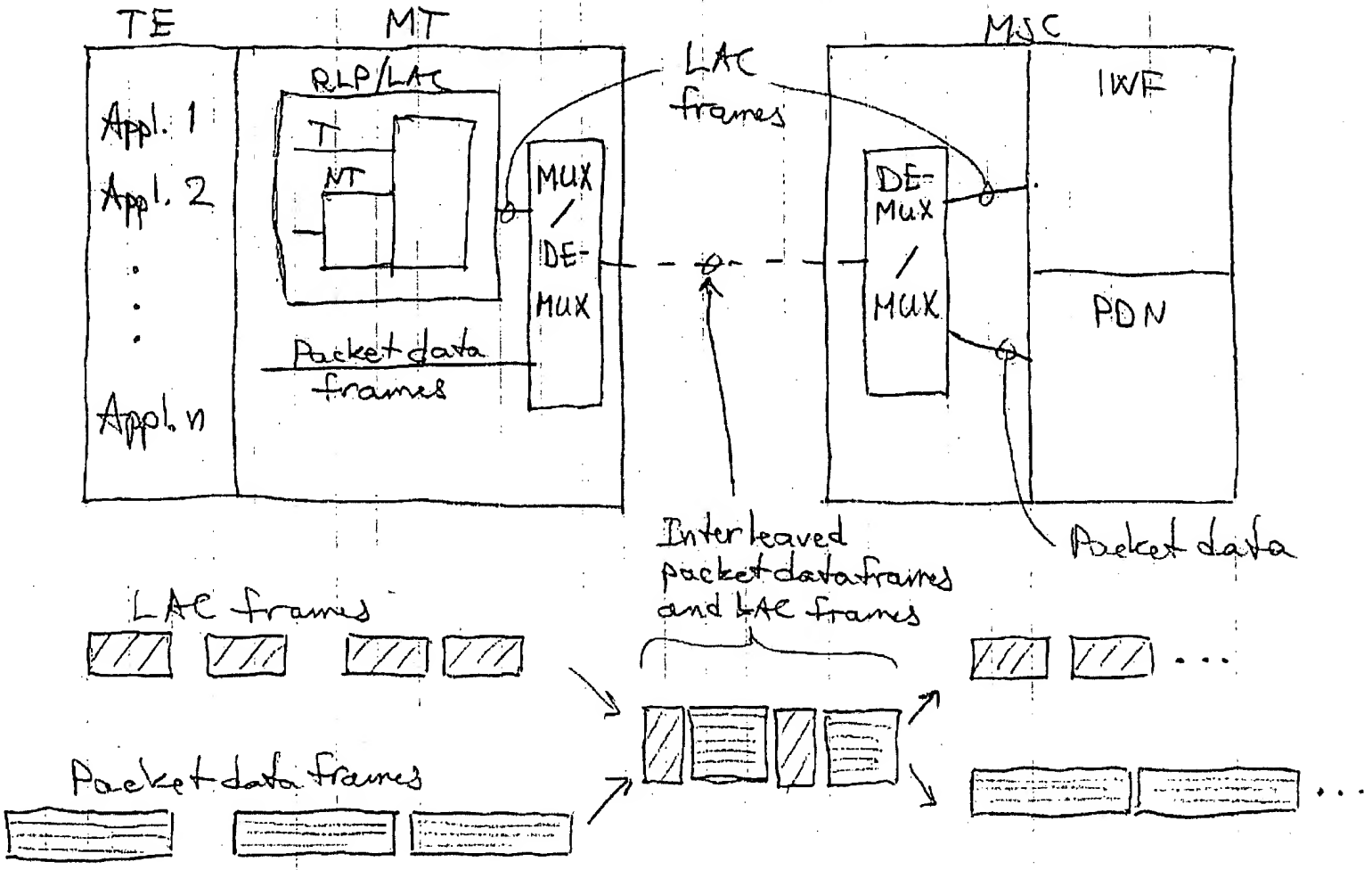


Figure 4. Interleaving packet data frames and LAC frames in a common channel.

JRa 17.2.98

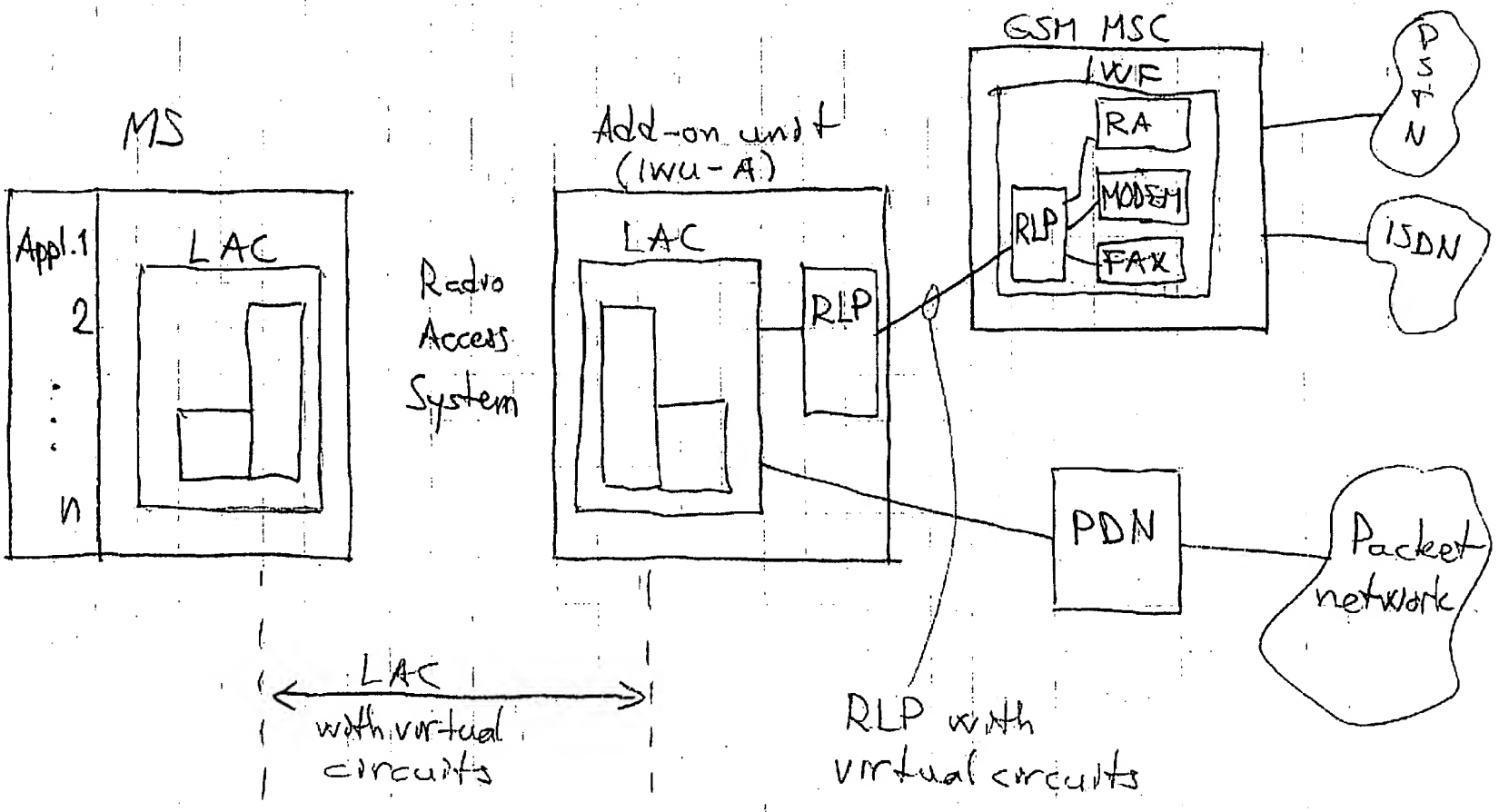


Figure 5: A 3rd gen. radio access with a circuit switched interworking via a GSM MSC IWF.

JR5 17.2.98

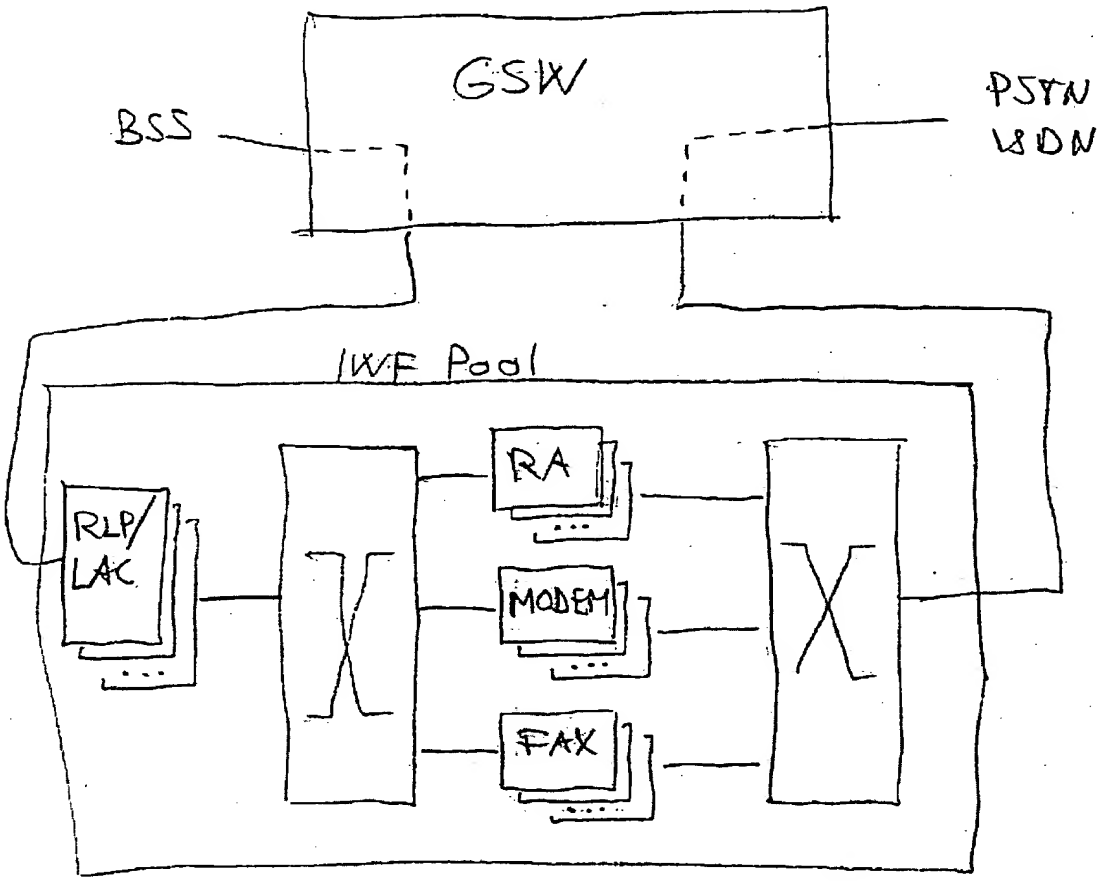


Figure 6. A multi capability IW pool. Each RLP/LAC entity can access all kinds of fixed network interworking resources, several at the same time.

JR 17.8.98

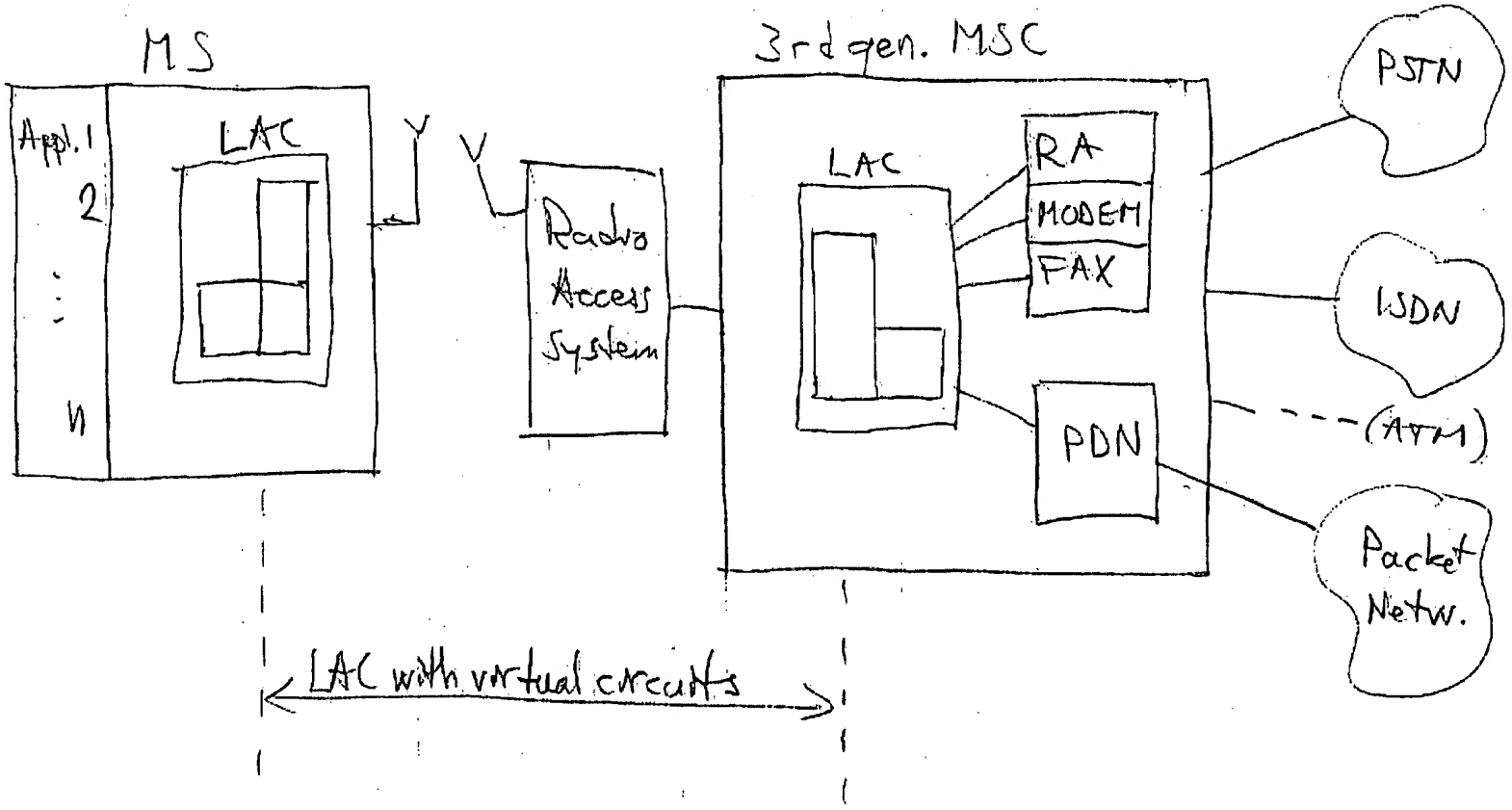


Figure 7. A pure 3rd gen. environment.